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TESTS OF REFRIGERATION AND MISCELLANEOUS EQUIPMENT

Progress Report
July 1 - November 30, 1953

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by

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NBS

U. S. DEPARTMENT OF COMMERCE
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PROGRESS REPORT

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OFFICE OF THE QUARTERMASTER GENERAL

July 1 - November 30, 1953

Drifreez Dehydrator

The final draft of the report on the performance of several models of the Drifreez dehydrator is about half completed. This report will be completed in the next two weeks. It will present results on drying tests, vibration tests, and a discussion of possible hazards from the use of calcium carbide as a refrigerant drier.

Longstreth Compressor Tests

It was determined in conferences with representatives of the Office of The Quartermaster General not to modify the test installation of the Longstreth compressor to permit testing at speeds up to 4,000 rpm. The investigation was terminated and a rough draft of the report on this item has been completed and is now under review.

Gasoline Lanterns

The data were analyzed and the report submitted, under date of July 14, on two prototype inverted gasoline lanterns for operating characteristics at -45°F, 70°F and 135°F ambient temperature. The results indicated that the test specimens, which were not new, would not light at -25°F; did not give sufficient light at normal room ambient temperatures and produced dangerously high pressures at ambient temperatures higher than 135°F.

A third specimen of the inverted lantern, as submitted by the manufacturer, was tested for pressure relief valve characteristics as well as luminosity, in the presence of representatives of the Office of

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Mattress Dehydrator

The final draft of the report on the performance of several models of the Mattress dehydrator is about half completed. This report will be completed in the next two weeks. It will present results on drying tests, vibration tests, and a discussion of possible hazards from the use of calcium carbide as a refrigerant dryer.

Lungstroth Compressor Tests

It was determined in conferences with representatives of the Office of The Quartermaster General not to modify the test installation of the Lungstroth compressor to permit testing at speeds up to 4,000 rpm. The investigation was terminated and a rough draft of the report on this item has been completed and is now under review.

Gasoline Lanterns

The data were analyzed and the report submitted, under date of July 15, on two prototype inverted gasoline lanterns for operating characteristics at -65°F, 70°F and 135°F ambient temperature. The results indicated that the test specimens, which were not new, would not light at -65°F; did not give sufficient light at normal room ambient temperature and produced dangerously high pressure at ambient temperatures higher than 135°F.

A third specimen of the inverted lantern, as submitted by the manufacturer, was tested for pressure relief valve characteristics as well as luminosity, in the presence of representatives of the Office of

The Quartermaster General and the manufacturer. A report of the results obtained was prepared and transmitted to the OQMG under date of August 12. Results on this new specimen indicated that the pressure relief valve would operate satisfactorily when carefully fabricated and with a good valve sufficient light would be emitted at normal room ambient.

Tests were made and a report submitted to the OQMG, under date of October 21, on a method for reducing breakage of mantles in a standard pressure gasoline lantern. Results indicated that a spider of the proper dimensions used in a bored-out mantle tip assembly practically eliminates mantle breakage when lighting.

Federal Specification AA-R-211c

Replies to an inquiry addressed to members of the refrigerator industry were received during the past quarter, and the work of revising this Federal Specification has been started. The information obtained from industry includes a summary of construction features and descriptions of special components furnished on commercial models of refrigerators.

Gasoline Tent Heaters

A final report is about half completed on the performance of four specimens of the propeller fan when used with tent heaters manufactured by two different companies. The report will also show the effect of fan position in the shroud on the performance of the several fan blades as well as a comparison of the dimensions and pitch angle of the several specimens. A calibration was made of two test ducts supplied as field test apparatus for future evaluation of heater performance and the static pressure resulting at the heater

outlet for several arrangements of the canvas ducts ordinarily furnished with the heater will also be reported.

Defrosting Test

Tests of the defrosting characteristics of the current design of the 1-ton gasoline driven warehouse refrigerating unit (Therm King Model MQ-51) are presently being conducted. Conditions being studied are:

a. With automatic control of defrosting cycle.

b. With manual control of defrosting cycle.

c. At 35° F refrigerator temperature.

d. At 0° F refrigerator temperature.

The first phase, with an empty 600 cu ft warehouse, has been completed. A second phase with a loaded warehouse is yet to be done. All tests were run at 60 percent R.H. At 35° F refrigerator temperature, the defrost cycle on automatic control occurred at intervals of approximately 4 1/2 hrs, lasted from 16 to 18 minutes and the condensate from each defrost varied from 26 to 36 lbs. Under manual control, the time required to block the coil with sufficient ice to reduce the unit refrigerating capacity to approximately 6650 BTU/hr was 36 hrs, and the amount of condensate collected was nearly 49 lbs. Fifty minutes were required to defrost and the warehouse temperature rose to 40° F during defrost.

At 0° F refrigerator temperature, the frequency of defrost cycles under automatic control was once per 4 1/2 hrs, the defrost period varied from 12 to 17 mimutes, and condensate ranged from 2 1/4 to

1 1/4 lbs for each defrost. Under manual control, the time required to block the coil with sufficient ice to reduce the capacity to approximately 7200 BTU/hr was in excess of 65 hrs, and the amount of condensate was 23 3/4 lbs. The refrigerator temperature rose to 5° F during the defrost period which lasted about 26 minutes. Under manual control, the refrigeration is started after defrost by the same temperature-limit thermostat on the evaporator coil as used under automatic control.

The second phase, with the warehouse loaded, will be started soon.

1/2-Ton Plug-Type Unit

Tests to determine refrigerating capacity of the Model L-10 Thermo King gasoline-driven, plug-type warehouse refrigerating unit at 110° F ambient temperature and at refrigerator temperatures of 10° F and 35° F have been completed for a range of compressor speeds from 1800 to 3000 rpm. Fan speeds varied proportionally.

A 600 cu ft warehouse was used as a calorimeter, and had an overall conductance of approximately 65 BTU/°F/hr. At 110° F ambient the lowest temperature the unit was capable of producing in the test warehouse was 6.3° F at 1800 rpm (6900 BTU/hr), 1.7° F at 2300 rpm (7350 BTU/hr), 1.5° F at 2400 rpm (7350 BTU/hr), 3.7° F at 2700 rpm (7250 BTU/hr), and 4.3° F at 3000 rpm (7100 BTU/hr).

At 110° F ambient and 10° F refrigerator temperature, the capacity varied from 8200 BTU/hr at 1800 rpm, 8800 BTU/hr at 2100 rpm, 9200 BTU/hr at 2400 rpm, 9250 BTU/hr at 2700 rpm to 9100 BTU/hr at 3000 rpm.

At 110° F ambient and 35° F refrigerator temperature, the observed capacities were 7700 BTU/hr at 1875 rpm, 11,650 BTU/hr at 2160 rpm, 14,300 BTU/hr at 2400 rpm, 16,800 BTU/hr at 2700 rpm, and 12,500 BTU/hr at 3000 rpm.

Air Distribution in Refrigerated Trailer

Preliminary investigation of the literature in regard to this problem has been made. Installation of the trailer in the test area has been done and temperature measuring thermocouples have been installed. The style of air velocity measuring devices for the low range velocities has been selected and will be constructed at the Bureau.

1/3-Ton Plug-Type Unit

A study of the effect on capacity of a 1/3-ton (nominal) gasoline-driven warehouse refrigerating unit (Model U-150 Thermo King) of variation of compressor speed has been completed. Tests were made with the evaporator and condenser fan speeds varied in proportion to the variation in engine speed and with the fan speeds held constant at two fixed rates. All tests were made at 110° F ambient and with a 0° F refrigerator temperature.

A report on the performance of this unit is partially completed.